Review Order is flawed and not economically meaningful. As indicated in Christensen's

Response to Appendix F. attached herein as Appendix B. any observed short-term differences in

input price growth do not represent a difference in the underlying trends of input prices.[37] The

volatility of this series is so great that observed differences cannot be statistically distinguished

from a difference of zero. This also means that there is no statistical basis for using an observed

short run differential as a projection of expected future trends.[38]

NYNEX is concerned with any attempt to add an input price differential. either through a

fixed factor or a moving average. based on short term data. The use of a short term moving

average input price differential adjustment would introduce a large amount of volatility to the

resultant productivity offset. This volatility would result in dramatic changes in the level of the

price cap indices. a result which would not be beneficial to either the LECs or to the customer. A

fixed factor input price differential based on short term data would also be damaging as it would

be unlikely to represent any true future input price differential. As noted by Christensen, the

inclusion of an input price differential term in the price cap offset based on recent short term

fluctuations is likely to be in the wrong direction. because short term differences in one direction

tend to be offset by subsequent short term differences in the other direction.[39]

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[37] NERA also addresses trends in LEC input prices. Similar to Christensen, NERA shows that LEC input prices grow at the same rate as U.S. input prices. NERA finds that reliance on point estimates of the difference between LEC and U.S. industry input price growth rates is misplaced: and measures of LEC productivity growth relative to the U.S. as a whole provide reliable targets for the annual price cap adjustment formula. and attempts to adjust that formula using short term changes in the input price differential are unwarranted.

[38] Appendix B, Response to Appendix F: The Appropriate Data Set to Use in Analyzing Telephone Industry Input Prices. p. 8.

[39] Id. at p. 11.

I.   **Rescheduling Of Performance Reviews**

The Commission requests comment on whether it would desirable to schedule a LEC

price cap performance review, and if so, when.[40]

As discussed herein, NYNEX recommends the use of a moving TFP X-Factor for the

long term price cap plan, and we show how such a factor would be preferable to a fixed X-Factor

developed through periodic reviews. One of the benefits of a moving average X-Factor is that it

eliminates the need for costly and labor-intensive review processes. This method enables annual

updates of the productivity factor, and eliminates the need to schedule an additional performance

review at this time. NYNEX believes, however, that the Commission should be open to

reexamining any aspect of the long term price cap plan particularly in light of increasing

competition.

IV.   **OTHER METHODOLOGIES FOR CALCULATING THE X-FACTOR DO NOT
        SATISFY THE COMMISSION'S CRITERIA AND SHOULD BE REJECTED**

The Commission invites comment on a number of other alternatives for calculating the

X-Factor, specifically: the Historical Revenue Method, the Historical Price Method, a Combined

Revenue/Price Method, possible continuation of the interim plan, and econometrics.[41]

As shown below, the other methods for calculating the X-Factor raised for consideration

by the Commission do not satisfy the Commission's criteria specified for the X-Factor

methodology. Most importantly, they do not yield economically meaningful X-Factor values.

These methodologies, therefore, should be rejected.[42]

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[40]   X-Factor NPRM Issue 8, ¶¶ 142-43.

[41]   X-Factor NPRM at ¶¶ 77-93.

[42]   NYNEX supports the analyses of these methodologies contained in USTA's Comments in response to the X-
       Factor NPRM.

A. Historical Revenue Method (AT&T Direct Model)

The X-Factor NPRM asks for comment on the use of the Historical Revenue Method for calculating the X-Factor in the long term plan.[43] The Commission asks if the Historical Revenue Method is superior to a TFP method (Issue 2a), and asks parties to discuss the advantages and disadvantages of the Historical Revenue Method.

The Historical Revenue Method, also referred to as the AT&T Direct Model (earnings implied X), derives the X-Factor based on LECs' revenues and costs using publicly filed data from ARMIS and the Tariff Review Plans ("TRPs"). The Historical Revenue Method essentially determines the X-Factor that would be needed to reprice LEC access services to achieve an 11.25% rate of return for the LEC industry as a whole under price caps.[44]

As indicated in the attached NERA Analysis (Appendix C), an earnings based X-Factor is not economically meaningful because the use of LEC earnings as measured by regulatory accounting rules are very poor proxies for economic profit. Accounting earnings generally overstate actual economic performance. An earnings based X-Factor also reintroduces efficiency disincentives which price cap regulation has been designed to eliminate. More importantly, adjusting a price cap plan subsequent to a company's effort to increase productivity and increase earnings would severely erode the incentives of the plan, creating a thinly disguised version of traditional cost-plus regulation. The efficiency benefits of price cap regulation depend upon companies having confidence that increased cost savings will not ultimately be taken away through rate of return-type regulation. An earnings based X-Factor also leads to the

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[43] X-Factor NPRM at ¶¶ 77-83.

[44] See Price Cap Review Order at ¶¶ 127-28.

administrative regulatory issue of reconsidering the "authorized" rate of return. Indeed, by resurrecting a form of rate of return regulation, this method is inconsistent with price cap regulation. Accordingly, as detailed by NERA in Appendix C, the Commission should reject the use of the Historical Revenue Method.

B. Historical Price Method (Frentrup-Uretsky Study)

The Commission poses questions relative to whether the Historical Price Method is superior to the TFP approach for calculating the X-Factor.[45] The Commission also inquires whether it would be necessary to add prices for special access services in the X-Factor.[46]

As detailed in the attached NERA Analysis, the Historical Price Method (Frentrup-Uretsky Study) is less effective than a TFP methodology for the LEC price cap plan. The Historical Price Method does not measure productivity -- it infers changes in productivity from changes in prices. The Historical Price Method is therefore less economically meaningful than TFP. In addition, there are practical consequences associated with the use of the Historical Price Method for calculating productivity growth for a subset of services such as interstate access services; i.e., accounting costs must be assigned to keep earnings constant over a historic period. The Historical Price Method also suffers from the inability to obtain data on LEC prices for special access services. Developing prices for these services from publicly available data, a Commission criterion, may prove problematical. More importantly, this method produces a fixed X-Factor which is less likely to flow benefits to consumers than a moving average TFP

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[45]   X-Factor NPRM Issue 2b. ¶¶ 87-90.

[46]   X-Factor NPRM at ¶ 88.

method, and less likely to encourage LECs to reduce unit costs. For these reasons, the Commission should reject the use of the Historical Price Method.[47]

C.   Combined Revenue/Price Method

The Commission raises questions relative to developing a process to combine the Historical Revenue Method and the Historical Price Method.[48] The method suggested for consideration by the Commission -- modifying the Historical Revenue Method to create a time series of average weighted PCIs for each basket, adjusted to earn a target rate of return -- suffers from the same fundamental problems as the Historical Revenue Method. An earnings based X-Factor is not as economically meaningful as a TFP method. The process would also increase the administrative burden of developing a target rate of return. Moreover, this method, like the Historic Revenue Method, reduces efficiency incentives to reduce unit costs. This form of methodology should also be rejected.

D.   Continuation Of Interim Plan

The Commission raises the possibility of making permanent the Price Cap Review Order interim plan.[49] However, this would be an unwarranted step backwards. NYNEX recommends that the interim plan not be used as a long term plan. This phase of the proceeding should establish a sufficient record to allow the FCC to implement a moving average TFP method to replace the fixed factor approach of the interim plan, eliminate sharing whenever possible, and adopt a proposal such as that advanced by NYNEX to promote competition through cooperative interconnection and mutual compensation agreements with new entrants. However, if the

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[47]   See also NERA Analysis.

[48]   X-Factor NPRM at ¶ 91.

[49]   X-Factor NPRM at ¶ 92.

Commission does not regard the issues as sufficiently addressed to issue an Order by March

1996, NYNEX would not oppose an extension of the interim plan for the 1996 annual filing.

E. Econometrics

Econometric estimation of TFP changes over time. as discussed in ¶ 75 of the X-Factor

NPRM, would introduce substantial complexity to produce an economically meaningful TFP

result. For this reason alone. an econometric method would fail the simplicity criterion.

Furthermore. the use of econometrics would produce uncertainty and controversy over the

selection of the correct parameter values required to perform a meaningful study. This would

only serve to delay the adoption of a long term price cap plan.

F. Inappropriateness Of Consumer Productivity Dividend

The Commissions asks for comment on whether a Consumer Productivity Dividend

(CPD) should be included in the X-Factor.[50] A CPD is no longer necessary or appropriate.

A CPD of 0.5% was included in the original price cap plan to assure that the initial

efficiency gains from replacing rate of return regulation with price cap regulation would flow to

customers in the form of lower rates.[51] The level of the CPD was arbitrary, but it was assumed

there would be improvements in productivity under an incentive plan and that a CPD added to a

fixed X-Factor would account for these expected benefits. A CPD was considered a necessary

safeguard against possible excess earnings. because a fixed X-Factor was being used for a

predetermined period of time (four years). Now that the industry has been operating under price

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[50] X-Factor NPRM Issue 2c, ¶ 94.

[51] See LEC Price Cap Order, 5 FCC Rcd. 6786. ¶ 100 (1990).

caps for a number of years, a CPD cannot be justified in order to capture efficiencies from eliminating rate of return regulation.

Further, the use of a moving average TFP derived X-Factor eliminates any need for a CDP safeguard. The industry TFP will quickly track any increases or decreases in productivity. Importantly, adding a CPD to the X-Factor would eliminate much of the efficiency incentives which are inherent in a pure industry X-Factor. Finally, a CPD is inherently arbitrary and not economically meaningful, and therefore it is contrary to the Commission's X-Factor criteria.

V. THE SEPARATE COMMON LINE FORMULA CAN AND SHOULD BE ELIMINATED

The Commission adopted the balanced 50/50 common line formula in the 1990 LEC Price Cap Order (¶ 69). There the Commission concluded: the LECs influence growth in interstate usage; there was no determinative evidence in the record to establish whether future productivity from demand increases will originate more from LEC or interexchange carrier ("IXC") efforts; and, therefore, future growth can be maximized only if both LECs and IXCs are encouraged to search out ways to be more productive, and both are rewarded for their successes.

In the Price Cap Review Order (¶¶ 271-73), the Commission elected to retain the balanced 50/50 formula approach for the 1995 annual access tariff filing. Although the Commission tentatively concluded that the per-line formula is superior to the per-minute formula and the 50/50 formula, the Commission elected to retain the balanced 50/50 formula in light of the lack of consensus on the record and the Commission's intention to issue a further NPRM

addressing this issue. Additionally, the Commission observed that revising the common line

formula for an interim plan would create excessive rate churn and confusion.[52]

In the X-Factor NPRM, the Commission requests comment on the circumstances under

which the adoption of a particular X-Factor method would justify the elimination of a separate

common line formula.[53] The moving average TFP method allows for the elimination of a

separate common line formula in the price cap plan. The TFP method captures all changes in

LEC productivity over time regardless of whether they are driven by changes in minutes or lines,

and that method should be applied to all price cap baskets including the current common line

basket. No other adjustment is required to common line rates. The use of a moving average TFP

method would ensure that these changes in demand are applied to the price cap formula in a

timely manner. If the Commission adopts the TFP method and further adjusts the common line

basket with a per-line formula, the productivity gains in common line would be double-counted.

The Commission also asks whether, if a separate common line formula is retained, a per-

line common line formula or some other formula should be adopted.[54] It is NYNEX's position that

if the Commission elects to retain a separate common line formula, the per-line formula should not

be adopted. A per-line formula would not recognize the contribution that LECs make to common

line usage growth and would not provide an incentive for LECs to promote greater common line

usage. Access charge reductions have been a major factor underlying the decreases in long

distance prices over the past ten years. These access charge reductions have therefore influenced

growth in minutes of use. Thus, the level of access rates has had a significant influence on

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[52] Price Cap Review Order at ¶ 272.

[53] X-Factor NPRM Issue 6a, ¶ 133.

[54] X-Factor NPRM Issue 6b, ¶ 136.

common line usage. In addition, the LECs stimulate common line usage through the introduction

of new services, marketing and advertising, and the introduction of new technologies. As such, the

LECs should receive benefits associated with increased common line usage.

Experience has confirmed the reasonableness of the Commission's conclusion that the

LECs influence interstate minutes of use ("MOU") demand. LECs have introduced a variety of

service features including "Call Return," "Call Waiting" and "Call Answering," which have

stimulated increases in interstate as well as intrastate demand. For example, Call Return returns

a call to the last telephone number that called whether or not answered. Call Waiting allows for

the completion of a call which otherwise would have encountered a busy signal and not have

been completed. These features, as well as Call Forwarding and Repeat Dialing, facilitate call

completion, whether it is intrastate or interstate. In addition to these Custom Calling features, the

LECs also directly provide some services that generate interstate carrier common line ("CCL")

minutes of use, such as foreign exchange lines and interexchange long distance (such as NYNEX

corridor service). The marketing of these services, including the development of rates and

introduction of new service features, stimulate CCL demand. In addition to the marketing of

existing services, the development of entirely new common line based services such as ISDN

increases the value of common lines to customers, and thus the usage per line.

IXCs have argued that it is their advertising which results in increased volumes of

interstate calling per line. However, the predominant theme of the IXC advertising is potential

savings from changing IXCs. IXC advertising probably has a greater impact on the volume of

PIC changes than in generating an increase in interstate demand. Subscribers have simply given

their minutes of use to a different IXC.

The use of a per-line formula would eliminate incentives for the LECs to increase common line demand and upgrade the common line infrastructure. If a per-line formula were used. LECs would be encouraged to focus on cost reduction rather than on network upgrades, new service deployment and marketing efforts which would stimulate demand and usage. The per-line approach would tend to curtail modernization such as deploying fiber in the loop, and retard the delivery of information services. For these reasons. the Commission should not adopt the per line CCL formula.

The continued use of a separate common line formula would also impact access reform. A separate formula for the common line basket represents an obstacle to implementing access reform-related changes, comparable to how sharing has been an obstacle. Incorporating a separate formula for the common line basket impacts the ability to modify the price cap basket structure to transition to a competitive environment and ultimately to streamlined regulation. In NYNEX's Comments in response to the LEC Pricing Flexibility NPRM, we recommend substantial changes from the existing baseline price cap basket and rate structure to the basket structure which would be appropriate when a company has removed barriers to entry and shown that competition is present (Framework C). The Commission should consider changes to the common line rate structure in that proceeding and in a comprehensive proceeding on reform of the access charge structure. A proper framework for access reform should lead to more economic recovery of common line costs, including increases in EUCLs. recovery of long term support on a market share basis, and multiline CCL recovery through charges per presubscribed line. This rate structure would minimize concerns relating to benefits from MOU growth, and would also serve to negate the need for a separate common line formula.

VI. UNDER THE MOVING AVERAGE TFP METHODOLOGY, MANY EXOGENOUS COST ADJUSTMENTS WOULD NO LONGER BE NECESSARY

The Commission invites comment on a number of issues related to exogenous cost changes under price caps.[55]

In the LEC Price Cap Order (¶ 166), the Commission determined that certain costs incurred by LECs that are caused by administrative, legislative or judicial requirements beyond their control, and not otherwise reflected in the PCI, should result in an adjustment to the PCI to ensure that the price cap formula does not lead to unreasonably high or low rates. In the Price Cap Review Order (¶ 293), the Commission reduced the number of items which qualify for exogenous cost treatment by limiting such treatment for accounting changes to instances where the change affects a carrier's discounted cash flow. In addition, the Commission does not automatically grant exogenous cost treatment for many cost items. LECs must file a petition for waiver or petition for declaratory ruling in order to request exogenous cost treatment for items not specifically listed in Part 61 rules.

The Commission asks for comment on whether it is feasible to fashion an X-Factor that will routinely include costs currently classified as exogenous and exclude costs that the Commission has determined are not exogenous.[56] A moving average TFP methodology as recommended by NYNEX herein will include all costs borne by the LECs and reflect them in the productivity offset in a timely manner. While an industry average TFP cannot recognize

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[55] X-Factor NPRM Issues 7a, 7b, ¶¶ 138-41.

[56] X-Factor NPRM Issue 7a, ¶¶ 139-40.

disproportionate levels of these costs across the companies, the costs in total will be reflected in the industry average TFP and will affect all price cap companies through the price cap formula.[57]

Jurisdictional cost changes represent one type of change which will not be fully accounted for by the TFP methodology. Separations changes, which are beyond the control of the carrier, would not be reflected in the productivity offset because the TFP is calculated on a total company basis. Separations changes do not typically increase or decrease total costs but shift existing costs from one jurisdiction to another. As such, these changes would not impact the total company TFP result. Separations changes can, however, have a substantial effect on the interstate revenue requirement. As a result, exogenous cost treatment is required for Separations changes.

Thus, if the Commission adopts a moving average TFP methodology based on total company data, NYNEX recommends that exogenous treatment be allowed for regulatory changes such as Separations changes which will result in shifts between the interstate and intrastate jurisdictions or changes between regulated and nonregulated accounts.[58] Other changes will ultimately be reflected in the moving average TFP result. This will simplify the price cap filing process and eliminate much of the administrative work associated with the preparation and review of exogenous cost filings.

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[57] As recognized by the Commission in the Price Cap Review Order (¶ 292):

"A properly designed X-factor would recognize almost all of the costs for which exogenous treatment would now be accorded, leaving exogenous cost treatment requests only to cost changes which are truly unique to individual LECs."

There may be a very limited number of costs truly unique to individual LECs which would qualify for exogenous treatment.

[58] X-Factor NPRM Issue 7b, ¶ 141.

If the Commission, however, adopts a fixed TFP methodology (i.e., one not calculated on a moving average), or calculates the productivity offset using any other method, exogenous cost treatment should continue to be allowed for those items triggered by administrative, legislative or judicial actions beyond the control of the carrier -- all items which are currently allowed under the interim plan. A fixed TFP methodology would not be able to reflect cost changes in the productivity offset.[59]

VII. CONCLUSION

NYNEX's proposals herein on the determination of the X-Factor (or productivity offset) and other elements of the long term price cap plan should be adopted. Our proposals will advance pro-competitive goals, improve efficiency incentives and ease regulatory burdens.

Respectfully submitted,

The NYNEX Telephone Companies

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Dated: December 18, 1995
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[59] Additionally, the Commission should continue to allow the filing of petitions for waiver or declaratory ruling to secure exogenous treatment for items not specifically listed.

TOTAL FACTOR PRODUCTIVITY METHODS FOR LOCAL EXCHANGE CARRIER PRICE CAP PLANS

Laurits R. Christensen
Philip E. Schoech
Mark E. Meitzen

December 18, 1995

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TOTAL FACTOR PRODUCTIVITY METHODS FOR
LOCAL EXCHANGE CARRIER PRICE CAP PLANS

Laurits R. Christensen, Philip E. Schoech
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Christensen Associates
December 18, 1995

In its <u>Fourth Further Notice of Proposed Rulemaking</u>,[1] the FCC has

raised a number of questions regarding the appropriate methods for

measuring local exchange carrier total factor productivity (LEC TFP). In

particular, various questions have been posed by the FCC regarding the TFP

study we submitted in May of 1994 and updated in January of 1995.[2] In

this paper, we respond to the issues directly relevant to the Christensen TFP

methods.

In particular, the FCC has stated a concern that some of the data

used in our TFP study are not accessible and verifiable. Because of this

concern, we have developed a simplified method of TFP measurement based

solely on publicly-available data. We have also simplified some of the

computations, while continuing to apply standard practices in TFP

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[1] Federal Communications Commission, <u>Fourth Further Notice of Proposed Rulemaking</u>, FCC 95-406, September 27, 1995.
[2] Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation," Christensen Associates, May 3, 1994, and "Productivity of the Local Operating Telephone Operating Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 10, 1995. We refer to these collectively as our original study.

measurement. We believe that the simplified TFP method maintains accuracy and addresses concerns about verifiability.

Overview of Simplified TFP Method

The simplified TFP method is consistent with accepted productivity measurement practices and provides an accurate measure of productivity trends for LECs. It is based entirely on publicly-available data and contains other modifications to address concerns raised by the FCC. This allows the simplified model to be updated and verified in a straightforward manner. The simplified approach forms the basis of the "TFP Review Plan," submitted with the United States Telephone Association's comments in this proceeding.

We now summarize the differences between the methods and data sources in our original study and the methods and data sources in the simplified TFP study:

Output. The only way in which the measurement of output in the simplified model differs from the measurement of output in the original study is that the quantity of long distance service and the quantity of intrastate access service are derived by dividing booked revenue (as opposed to billed revenue), reported in the Form M (ARMIS 43-02), by the price indexes for long distance and intrastate access service.

Capital. There are five differences between the simplified model and the original TFP study regarding the measurement of capital. First, the simplified study uses the U.S. economy cost of capital implicit in the U.S. National Income and Product Accounts as the cost of capital in the rental price equation, instead of Moody's average yield on public utility bonds. Second, the simplified TFP method uses investment price indexes published by the U.S. Bureau of Economic Analysis instead of Telephone Plant Indexes. Third, the simplified TFP method employs beginning-of-year 1988 book values of gross plant, reported in the Form M, in the derivation of the capital benchmarks, instead of end-of-year 1984 current-cost of gross plant. Fourth, the simplified TFP method uses three-year moving averages of the cost of capital and capital gains in the rental price equation. Fifth, since some of the asset classes have the same BEA price indexes and depreciation rates, it is possible to simplify the computational procedures by consolidating those accounts. This consolidation does not affect the computed value of capital input. Buildings and cable and wire are consolidated into structures. Switching, transmission, and information origination/termination equipment are consolidated into communications equipment. General support equipment is not affected by this consolidation.

Labor. The simplified TFP method bases the quantity of labor input on the number of employees, reported in the Form M, instead of an index of management and non-management hours worked.

Materials. There is no difference in the way materials input is computed in the original TFP study and the simplified TFP method.

Simplified TFP Method Results

Table E-1 shows the results from the simplified method applied to the nine price cap companies included in our original study--Ameritech, Bell Atlantic, BellSouth, GTE, Nynex, Pacific Telesis, Southern New England, Southwestern Bell, and US West.

Shown in Table E-1 are the annual rates of growth in total output, total input, and TFP. In the original study, average annual TFP growth was found to be 2.4 percent over the 1984-1993 period and 2.8 percent over the 1988-1993 period. Using the simplified method with the nine companies in the original study, average annual TFP growth is 2.9 percent over the 1984-1993 period and 3.0 percent over the 1988-1993 period.

Table E-1
Comparison of LEC TFP Growth for Nine Companies in Original Christensen LEC TFP Study:
Original Results Versus Simplified Method
1984-1993

Year	Total Output Original	Total Output Simplified	Total Input Original	Total Input Simplified	TFP Growth Original	TFP Growth Simplified
1984						
1985	2.4%	2.8%	1.3%	0.6%	1.1%	2.2%
1986	3.0%	3.1%	0.2%	0.8%	2.8%	2.3%
1987	3.7%	3.8%	1.9%	1.1%	1.8%	2.7%
1988	5.2%	5.5%	3.1%	2.0%	2.1%	3.5%
1989	4.8%	4.6%	2.7%	2.8%	2.0%	1.8%
1990	3.7%	4.1%	-0.9%	-0.2%	4.6%	4.3%
1991	2.3%	2.4%	1.1%	0.6%	1.2%	1.8%
1992	1.9%	2.3%	-1.6%	-0.9%	3.5%	3.2%
1993	3.6%	4.2%	1.0%	0.1%	2.6%	4.1%
Average Growth						
1984-93	3.4%.	3.6%	1.0%	0.8%	2.4%	2.9%
1988-93	3.3%	3.5%	0.5%	0.5%	2.8%	3.0%

Table E-2 shows results of the simplified method for 1988 through 1994 with Lincoln and Sprint added to the sample. The starting year for the simplified study with the expanded sample of companies is 1988 rather than 1984. This is done to eliminate adjustments required to 1984-1987 data because of the Uniform System of Accounts Rewrite (USOAR) that took effect in 1988. The expanded sample also contains results for 1994. Using the expanded sample of companies, the simplified method produces average annual TFP growth of 2.9 percent over the 1988-1993 period. Over this

same period, U.S. economy TFP growth averaged 0.1 percent per year, resulting in a TFP growth differential between the LECs and the U.S. economy of 2.8 percent for the 1988-1993 period. For the 1989-1994 period, LEC TFP growth averaged 3.1 percent per year, U.S. TFP growth averaged 0.3 percent per year, resulting in a TFP growth differential of 2.8 percent.

Table E-2
LEC TFP Using the Simplified Method
Results for Expanded Sample of Eleven Price Cap Companies
1988-1994

Year	Total Output Growth	Total Input Growth	TFP Growth
1988			
1989	4.7%	2.9%	1.8%
1990	3.8%	0.0%	3.8%
1991	2.7%	0.7%	2.0%
1992	2.0%	-1.5%	3.5%
1993	4.0%	0.3%	3.7%
1994	3.8%	1.4%	2.4%
Average Growth			
1988-93	3.5%	0.5%	2.9%
1989-94	3.3%	0.2%	3.1%

Summary

In our original TFP study, our goal was to use the most accurate data available on LEC inputs and outputs to measure LEC TFP growth. In this paper, we show that the methods used in our original study provide an accurate measurement of LEC TFP growth since divestiture. We also

discuss how the simplified TFP method maintains accuracy while meeting the concerns raised by the FCC.

The methods we employed in our original LEC TFP study are rigorously developed from economic theory, and they provide economically meaningful measures of total factor productivity growth. These methods have been widely employed by numerous other productivity studies at the firm, industry, and national level. These methods are also very similar to those used by the U.S. Bureau of Labor Statistics (BLS), which has been publishing total factor productivity for the U.S. economy since 1983.

In most instances, the data in our original study were obtained from publicly-available sources. In some instances the data were obtained from internal company records, and in a few cases were derived from proprietary data. Since the FCC has stated a concern that some of the data used in our TFP study are not accessible and verifiable, we have developed a simplified method of TFP measurement based completely on publicly-available data. We believe that the simplified TFP method maintains accuracy as well as a proper balance between precision in measurement and verifiability.

TOTAL FACTOR PRODUCTIVITY METHODS FOR
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study we submitted in May of 1994 and updated in January of 1995.[2] We

respond herein to the issues directly relevant to the Christensen TFP

methods.

The methods we employed in our original LEC TFP study are the same

as those employed by Christensen, Christensen, and Schoech[3] in their pre-

divestiture study of the Bell System. They are rigorously developed from

economic theory, and they provide economically meaningful measures of

total factor productivity growth. These methods have also been widely

employed by numerous other productivity studies at the firm, industry, and

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[1]Federal Communications Commission, <u>Fourth Further Notice of Proposed Rulemaking</u>, FCC 95-406, September 27, 1995.

[2] Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation," Christensen Associates, May 3, 1994, and "Productivity of the Local Operating Telephone Operating Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 10, 1995. We refer to these collectively as our original study.

[3] Laurits R. Christensen, Dianne C. Christensen, and Philip E. Schoech, "Total Factor Productivity in the Bell System, 1947-1979," Christensen Associates, September 1981.

national level.[4] These methods are also very similar to those used by the U.S. Bureau of Labor Statistics (BLS), which has been publishing total factor productivity for the U.S. economy since 1983. (Appendix 1 lists the similarities in the methods employed by the BLS and the methods we employed in our LEC TFP study.)

In our original TFP study our goal was to use the most accurate data available on LEC inputs and outputs to measure LEC TFP growth. In most instances, the data were obtained from publicly-available sources. In some instances the data were obtained from internal company records, and in a few cases were derived from proprietary data. The FCC has stated a concern that some of the data used in our TFP study are not accessible and verifiable. Because of this concern, we have developed a simplified method of TFP measurement based completely on publicly-available data. In addition this model has simplified some of the computations, while continuing to represent standard practices in TFP measurement. We believe that the simplified TFP method maintains accuracy and addresses concerns about verifiability.

In the remainder of this paper, we respond to questions raised by the FCC. We show that the methods used in our original study provide an accurate measurement of LEC TFP growth since divestiture. We discuss

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[4] Our methods and data sources have also gone through a peer review process at the Journal of Regulatory Economics, which has accepted our LEC productivity study for publication.

how the simplified TFP method maintains accuracy while meeting the concerns raised by the FCC. Finally, we summarize the main features of the simplified TFP method and present its results.

Issue 1a. What is the most reasonable method to develop output price indices for TFP calculation purposes? What data source should be used to develop output price indices?

We believe that the methods employed in our original LEC TFP study are the most reasonable methods for developing output price indexes for TFP measurement. These methods provide a proper balance between the demands of economic theory and the constraints of data availability. Furthermore, we believe that the data sources we used in our original TFP study provide the most accurate basis for measuring LEC TFP growth. Most of the data sources are also publicly available. Only two of the data series used in the computation of output growth, billed long distance revenue and billed intrastate access revenue, are not obtained from publicly-available data sources.[5] Since concerns have been raised regarding data not obtained from publicly-available sources, the simplified TFP method that we are now proposing substitutes booked revenue--which is reported in the Form M and the ARMIS 43-02 Report--for billed revenue in the output computation. This modification results in little difference in the TFP results. By basing the

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[5] Prior to the reporting of Actual Price Indexes (API's) we relied upon non-public data for the computation of the Special Access price index. However, once API's became available, they were incorporated into the study.